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NOTES FROM PACIFIC COAST OBSERVATORIES.

LICK OBSERVATORY SEISMOGRAPH RECORD OF APRIL 18, 1906.

The intensity of the earthquake shock of April 18th at Mount Hamilton was less than the average intensity in the surrounding territory; on the unmodified* Rossi-Forel scale, it should be rated as about VII. In destructive violence the shock was not as severe as the local one of August 2nd, 1903, which received only passing notice outside Santa Clara County. The difference lay in the relation of displacement to time of displacement. The amplitude was several times as great in the recent earthquake, but the oscillation was much slower. Smooth vibrations with double amplitude of one or two centimeters (one-half or three-quarters of an inch,) pass unnoticed by the keenest observer, if their period be five seconds or more. Rapid or abrupt motions of one-tenth this amplitude are felt as sharp shocks.

The Ewing three-component† seismograph of the Lick Observatory gave a very satisfactory record, though the instrument was not designed for so great displacement and did not register all the motion. Professor OMORI has pronounced the record as of great value.

The north-south record is broken in two places; its three parts are marked N.S. or (N.S.) on the the accompanying reproduced tracing. The most remarkable north-south features are the long swings past the center of the plate and the indications of a wrench which seems to have jarred the pendulum from its bearings for a time. The vertical record leaves much to be desired. About ten seconds after the beginning, the pendulum was thrown from its bearings by the horizontal force of the heavy shock that also interrupted the north-south record, and was lodged against the standard. First, however, it registered a drop of nearly four centimeters, (one and one-half inches.) The east-west record is nearest complete, though the pen frequently passed beyond the cir-

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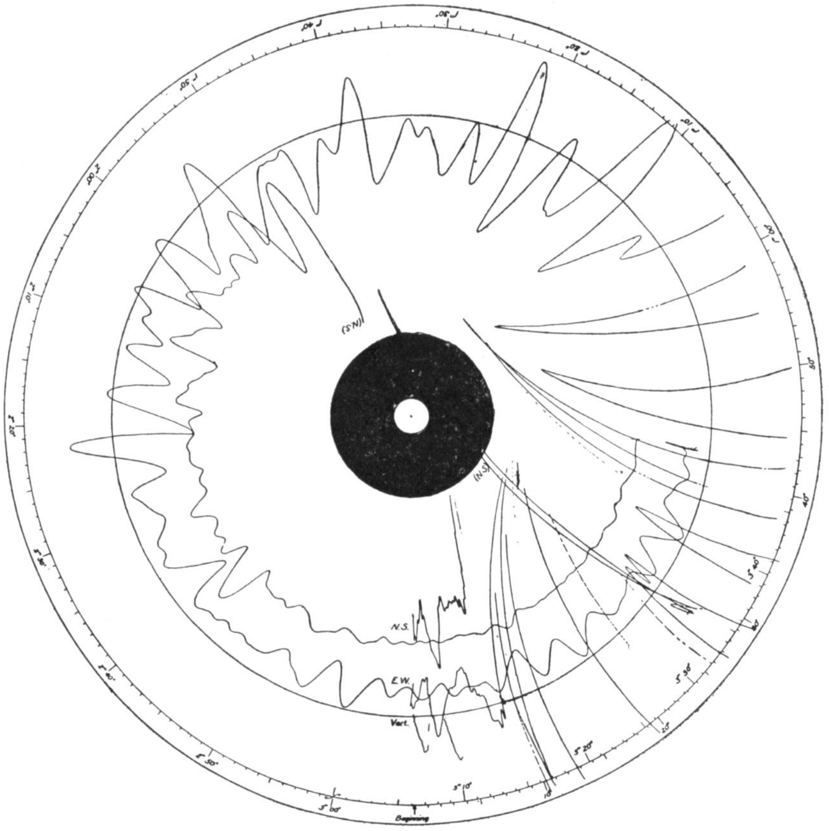
*Nature, 42, 349, 1890; Publ. A. S. P., 7, 123, 1895.

†See illustrated description of early forms of this instrument in Encycl. Brit., article Seismometer.



Ewing Seismograph Record of the Lick Observatory, 1906,
April 18, 5:12:12 A. M., P. S. T.

To exhibit these components as simultaneous, each record has been rotated so as to bring its beginning opposite the origin of time.

cumference of the revolving plate. At the end of three minutes and forty-nine seconds, when the plate stopped, the east-west pen continued to register slow vibrations of over half a centimeter, (one-quarter of an inch) double amplitude.

The record is complicated by the natural swing of the pendulums, and friction. To interpret the curves correctly, these must be taken into account. The horizontal pendulums swing with a free period of about seven seconds and come to rest from a maximum swing in a little over one complete vibration, if undisturbed. The vertical pendulum has a period of about four seconds, and will make about four complete swings. Small vibrations of the "earth particle," synchronous with the natural period of a pendulum, if continued, will soon set it swinging with large amplitude. In a less degree, oscillations of a different period will excite forced vibrations, with the resultant sort of compounding well illustrated by the last minute of the east-west record.

North, west and upward displacements are indicated by inward motion of the respective pens. To determine the real displacement in either component, the displacement shown in the cut, measured in the direction of a radius of the plate, after eliminating the instrumental effect, must be multiplied by the proper factor, following: N.S. 1.32, E.W. 1.44, Vert. 3.04. The actual direction and magnitude of the displacement at any moment, is obtained from the reduced component displacements, by simple compounding by parallelogram constructions. JAMES D. MADDRILL.

ON THE EARTHQUAKE OF APRIL 18, 1906.

It is not necessary to say that the earthquake of April 18th was very severe on Mount Hamilton, but it is a matter for congratulation that the observatory suffered no serious injury. Director CAMPBELL was in Washington, D. C., at the time, and Astronomer TUCKER was in charge. It was found that the telephone connection with San José was destroyed, and, as fires were observed to break out at once in San Jose and San Francisco, the seriousness of the situation was soon realized. Professor TUCKER dispatched a bicycle messenger to San Jose, bearing the message that "The buildings and instruments of the Lick Observatory were not injured by the earthquake." All was confusion in San Jose and there was no telegraph or telephone communication with the outside world. The messenger therefore rode on to Berkeley, 75 miles